Amendment to the Claims

In the Claims:

Please add new Claims 47-52, as indicated below.

Also, please amend Claims 1-5, 7, 8, 10, 11, 22-25, 33-35, and 42 as follows:

1. (Currently Amended) A bending die for use in sheet metal forming, comprising:

(a) a first working surface extending longitudinally relative to a longitudinal axis of the bending die, the first working surface being generally planar and comprising a first inner edge extending longitudinally relative to the longitudinal axis of the bending die;

(b) a second working surface extending longitudinally relative to the longitudinal axis of the bending die and disposed adjacent to said first working surface, the second working surface being generally planar and comprising a second inner edge extending longitudinally relative to the longitudinal axis of the bending die, the first inner edge and the second inner edge being oriented substantially adjacent to one another in a facing relationship; and

(c) a frame configured to provide support for said first and second working surfaces, while enabling said first and second working surfaces to move relative to the frame, such that a substantially fixed separation between ~~adjacent edges of the first and second working surfaces~~ the first inner edge and the second inner edge is maintained, regardless of a rotational angular displacement of either of the first and second working surfaces.

2. (Currently Amended) The bending die of Claim 1, wherein said adjacent ~~edges of said first and second working surfaces~~ first inner edge and second inner edge are separated by a substantial gap having a predefined width, said substantial gap affecting a configuration of the sheet metal formed with the bending die.

3. (Currently Amended) The bending die of Claim 1, wherein the adjacent ~~edges of said first and second working surfaces~~ first inner edge and second inner edge substantially abut one another.

4. (Currently Amended) The bending die of Claim 1, wherein said frame comprises a first section and a second section, a position of said first section relative to said second section being adjustable to enable a width of a gap separating the adjacent ~~edges of said first and second working surfaces~~ first inner edge and second inner edge to be adjusted to a desired dimension.

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LAW OFFICES OF RONALD M. ANDERSON
600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

5. (Currently Amended) The bending die of Claim 1, wherein for each working surface:

(a) a center of rotation is associated with the working surface;

(b) relative to a portion of the working surface that is in contact with the metal sheet during metal forming, the center of rotation is disposed proximate to an inner edge of said portion; and

(c) regardless of the rotational angular displacement of the working surface, the center of rotation remains substantially fixed relative to each working surface.

6. (Original) The bending die of Claim 1, further comprising a hinge assembly disposed at each end of the first and second working surfaces, each hinge assembly pivotally coupling said first and second working surfaces together, such that a rotational displacement of one of said first and second working surfaces results in a corresponding rotational displacement of the other one of said first and second working surfaces, through an opposite rotational direction.

7. (Currently Amended) The bending die of ~~Claim 6~~ Claim 47, wherein at least one hinge assembly includes a return spring that applies a restoring force to return said first and second working surfaces to their respective original positions after the sheet metal has been deformed in the bending die, and after a force is no longer applied to deform the sheet metal and the sheet metal has been removed from the bending die.

8. (Currently Amended) The bending die of ~~Claim 6~~ Claim 47, wherein each hinge assembly comprises a pair of sector gears, and a pair of rack gears that are mounted on the frame, each sector gear engaging a different rack gear and being mounted at an end of different ones of the first and second working surfaces.

9. (Original) The bending die of Claim 8, wherein said frame includes a generally U-shaped portion defined by support members disposed adjacent to the end of one of the first and second working surfaces, such that each rack gear is attached to a different support member.

10. (Currently Amended) The bending die of ~~Claim 6~~ Claim 47, wherein said first and second working surfaces are each generally rectangular in shape.

11. (Currently Amended) The bending die of ~~Claim 6~~ Claim 47, wherein each hinge assembly further comprises a first link and a second link joined by a pivot shaft, the first link being coupled to one sector gear, and the second link being coupled to another sector gear.

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600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

12. (Original) The bending die of Claim 1, wherein each of said first and second working surfaces comprises an angled upper surface having a shape selected to facilitate over-bending of the sheet metal.

13. (Original) The bending die of Claim 1, further comprising a resist element that applies a resisting force to said first and second working surfaces, the resisting force countering at least in part a force applied to deform the sheet metal.

14. (Original) The bending die of Claim 13, wherein the resist element comprises at least one of a stripper, a spring, an elastomeric material, a hydraulic component, a collapsible support, a movable support, and a pneumatic component.

15. (Original) The bending die of Claim 13, wherein said resist element comprises:

(a) a channel, said channel having a dimension substantially equal to said fixed separation;

(b) an elongate block partially disposed in said channel, said elongate block having a dimension smaller than said fixed separation; and

(c) a spring disposed in said channel so as to apply a restoring force against said elongate block in opposition to a deformation of the metal sheet into the channel, such that said elongate block is returned to an original position after the metal sheet is removed following the deformation of the metal sheet.

16. (Original) The bending die of Claim 1, further comprising a sector gear coupled to each one of said first and second working surfaces.

17. (Original) The bending die of Claim 16, further comprising a prime mover, and a plurality of driven gears configured to drivingly couple with the prime mover, each driven gear being disposed to engage one of said sector gears, such that as each driven gear is rotated, the corresponding sector gear is rotated.

18. (Original) The bending die of Claim 17, further comprising a plurality of shafts, such that each driven gear is coupled to one of said plurality of shafts.

19. (Original) The bending die of Claim 16, wherein said frame comprises a plurality of rack gears, such that each sector gear engages a different rack gear.

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600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

20. (Original) The bending die of Claim 1, wherein each of said first and second working surfaces comprises an elongate sector gear, and wherein said frame comprises opposed rack gears, such that the elongate sector gear on each one of said first and second working surfaces engages a different rack gear.

21. (Original) The bending die of Claim 1, further comprising a piston and a cylinder assembly disposed adjacent to each of said first and second working surfaces, such that each one of said first and second working surfaces is coupled to a different piston and cylinder assembly, each piston and cylinder assembly applying one of a driving force and a resisting force to a different one of the first and second working surfaces.

22. (Currently Amended) The bending die of ~~Claim 21~~ Claim 51, wherein each of said first and second working surfaces comprises a wing, such that each wing is coupled to a different piston and cylinder assembly.

23. (Currently Amended) The bending die of ~~Claim 21~~ Claim 51, wherein each piston and cylinder assembly comprises one of a hydraulic system, a pneumatic system, and a mechanical system.

24. (Currently Amended) The bending die of ~~Claim 21~~ Claim 51, wherein each piston and cylinder assembly is coupled to an actuator that controls a movement of said first and second working surfaces.

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LAW OFFICES OF RONALD M. ANDERSON
600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

25. (Currently Amended) A press brake for use in sheet metal forming, comprising:

(a) a first die extending longitudinally relative to a longitudinal axis of the press brake, said first die including a working surface configured to support a work piece, said working surface having an inner edge and an outer edge and being generally planar;

(b) a second die extending longitudinally relative to the longitudinal axis of the press brake and disposed adjacent to said first die, said second die including a working surface configured to support a work piece, said working surface having an inner edge and an outer edge and being generally planar; and

(c) a frame coupled to and supporting said first and second dies, while enabling said first and second dies to move relative to the frame, such that each die is able to rotate about a different respective center of rotation, and so that regardless of any rotational angular displacement of the die relative to the frame, the inner edge of the die is disposed closer to the respective center of rotation of the die than the outer edge of the die.

26. (Original) The press brake of Claim 25, wherein a substantially fixed separation is maintained between adjacent inner edges of the first and second dies, regardless of the rotational angular displacement of either one of the first and second dies about its respective center of rotation.

27. (Original) The press brake of Claim 26, wherein said frame is adjustable, so that said substantially fixed separation can be adjusted to a desired dimension, the desired dimension being substantially maintained regardless of the rotational angular displacement of either of the first and second dies.

28. (Previously Presented) The press brake of Claim 25, further comprising at least one spring operatively coupled to at least one of the first and the second dies, producing a restoring force that acts to return said first die and said second die to their respective original positions, after they have been rotatably displaced.

29. (Original) The press brake of Claim 25, further comprising a hinge assembly disposed at each end of the first and second dies, said hinge assemblies pivotally coupling said first and second dies together, such that a displacement of one of said first and second dies results in a corresponding displacement of the other of said first and second dies.

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600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

30. (Original) The press brake of Claim 29, wherein each hinge assembly comprises a pair of sector gears, and a pair of rack gears mounted on the frame, each sector gear engaging a different rack gear and being mounted at an end of different ones of the first and second dies.

31. (Original) The press brake of Claim 25, wherein each of said first and second dies comprises an elongate sector gear, and wherein said frame comprises opposed rack gears, each elongate sector gear of said first and second dies engaging a different rack gear.

32. (Original) The press brake of Claim 25, further comprising means for applying a force to each of said first and second dies, the force being applied for one of:

(a) countering at least in part a force applied to deform the sheet metal; and

(b) causing the rotational angular displacement of said first and second dies, in order to achieve a desired deformation of the sheet metal.

33. (Currently Amended) The press brake of ~~Claim 32~~ Claim 50, wherein each of said first and second dies comprises a wing, each wing being coupled to said means for applying a force.

34. (Currently Amended) The press brake of ~~Claim 32~~ Claim 50, wherein said means comprises one of a spring, an elastomeric material, a hydraulic system, and a pneumatic system.

35. (Currently Amended) The press brake of ~~Claim 32~~ Claim 50, wherein each of said first and second dies comprises a sector gear, and wherein said means comprises a prime mover and a plurality of driven gears that are drivingly coupled with the prime mover, to drivingly rotate the sector gear of each of said first and second dies.

36. (Original) The press brake of Claim 25, wherein each of said first and second dies comprises a sector gear, and said frame comprises a rack gear configured to engage each of said first and second dies.

37. (Previously Canceled)

38. (Previously Canceled)

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600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

39. (Previously Presented) A method for forming sheet metal, comprising the steps of:

(a) providing adjacent longitudinally extending, rotatable support surfaces;

(b) positioning the sheet metal on the rotatable support surfaces; and

(c) applying a deforming force to the sheet metal, causing the rotatable support surfaces to rotate in opposite directions in response to the deforming force, while maintaining a substantially fixed separation between adjacent edges of the rotatable support surfaces as they are rotatably displaced, said sheet metal being supported by the rotatable support surfaces when deformed by the deforming force into a desired shape.

40. (Previously Presented) The method of Claim 39, further comprising the step of restoring the rotatable support surfaces to an original position after the deforming force and the sheet metal are removed.

41. (Original) The method of Claim 39, wherein the step of maintaining the substantially fixed separation comprises the step of coupling the rotatable support surfaces to a framework with gears that constrain a rotatable displacement of the rotatable support surfaces so that a width of a gap between the adjacent edges of the rotatable support surfaces remains substantially fixed.

42. (Currently Amended) A method for forming sheet metal, comprising the steps of:

(a) providing adjacent longitudinally extending, rotatable support surfaces, each support surface including a generally planar portion configured to contact the sheet metal, each portion having an inner edge and an outer edge that extend along a longitudinal axis of the support surface;

(b) positioning the sheet metal on the rotatable support surfaces; and

(c) applying a deforming force that causes the rotatable support surfaces to rotate about different respective centers of rotation, so that for each support surface, regardless of a rotational angular displacement of the support surface about its respective center of rotation, the center of rotation remains fixed, and so that the inner edge of the portion is disposed closer to the center of rotation than the outer edge of the portion.

43. (Previously Presented) The method of Claim 42, wherein the step of applying a deforming force comprises the step of applying the deforming force to the sheet metal with an upper tool that contacts the sheet metal, such that the rotatable support surfaces rotatably move in response to the deforming force applied by the upper tool against the sheet metal.

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600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

44. (Previously Presented) The method of Claim 42, wherein the step of applying a deforming force to the sheet metal comprises the step of applying the deforming force to the rotatable support surfaces, such that the rotatable support surfaces apply the deforming force to the sheet metal, while an upper tool provides support for the sheet metal.

45. (Previously Canceled)

46. (Previously Canceled)

47. (New) A bending die for use in sheet metal forming, comprising:

(a) a first working surface extending longitudinally relative to a longitudinal axis of the bending die;

(b) a second working surface extending longitudinally relative to the longitudinal axis of the bending die and disposed adjacent to said first working surface;

(c) a frame configured to provide support for said first and second working surfaces, while enabling said first and second working surfaces to move relative to the frame, such that a substantially fixed separation between adjacent edges of the first and second working surfaces is maintained, regardless of a rotational angular displacement of either of the first and second working surfaces; and

(d) a hinge assembly disposed at each end of the first and second working surfaces, each hinge assembly pivotally coupling said first and second working surfaces together, such that a rotational displacement of one of said first and second working surfaces results in a corresponding rotational displacement of the other one of said first and second working surfaces, through an opposite rotational direction.

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600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

48. (New) A bending die for use in sheet metal forming, comprising:

(a) a first working surface extending longitudinally relative to a longitudinal axis of the bending die, a sector gear being coupled to said first working surface;

(b) a second working surface extending longitudinally relative to the longitudinal axis of the bending die and disposed adjacent to said first working surface, a sector gear being coupled to said second working surface;

(c) a frame configured to provide support for said first and second working surfaces, while enabling said first and second working surfaces to move relative to the frame, such that a substantially fixed separation between adjacent edges of the first and second working surfaces is maintained, regardless of a rotational angular displacement of either of the first and second working surfaces;

(d) a prime mover; and

(e) a plurality of driven gears configured to drivingly couple with the prime mover, each driven gear being disposed to engage one of said sector gears, such that as each driven gear is rotated, the corresponding sector gear is rotated.

49. (New) A bending die for use in sheet metal forming, comprising:

(a) a first working surface extending longitudinally relative to a longitudinal axis of the bending die, the first working surface comprising an elongate sector gear;

(b) a second working surface extending longitudinally relative to the longitudinal axis of the bending die and disposed adjacent to said first working surface, the second working surface comprising an elongate sector gear; and

(c) a frame configured to provide support for said first and second working surfaces, while enabling said first and second working surfaces to move relative to the frame, such that a substantially fixed separation between adjacent edges of the first and second working surfaces is maintained, regardless of a rotational angular displacement of either of the first and second working surfaces, said frame comprising opposed rack gears, such that the elongate sector gear on each one of said first and second working surfaces engages a different rack gear.

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LAW OFFICES OF RONALD M. ANDERSON
600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

50. (New) A press brake for use in sheet metal forming, comprising:

(a) a first die extending longitudinally relative to a longitudinal axis of the press brake, said first die including a working surface configured to support a work piece, said working surface having an inner edge and an outer edge;

(b) a second die extending longitudinally relative to the longitudinal axis of the press brake and disposed adjacent to said first die, said second die including a working surface configured to support a work piece, said working surface having an inner edge and an outer edge;

(c) a frame coupled to and supporting said first and second dies, while enabling said first and second dies to move relative to the frame, such that each die is able to rotate about a different respective center of rotation, and so that regardless of any rotational angular displacement of the die relative to the frame, the inner edge of the die is disposed closer to the respective center of rotation of the die than the outer edge of the die; and

(d) means for applying a force to each of said first and second dies, the force being applied for one of:

(i) countering at least in part a force applied to deform the sheet metal; and

(ii) causing the rotational angular displacement of said first and second dies, in order to achieve a desired deformation of the sheet metal..

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600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314

51. (New) A bending die for use in sheet metal forming, comprising:

(a) a first working surface extending longitudinally relative to a longitudinal axis of the bending die;

(b) a second working surface extending longitudinally relative to the longitudinal axis of the bending die and disposed adjacent to said first working surface;

(c) a frame configured to provide support for said first and second working surfaces, while enabling said first and second working surfaces to move relative to the frame, such that a substantially fixed separation between adjacent edges of the first and second working surfaces is maintained, regardless of a rotational angular displacement of either of the first and second working surfaces; and

(d) a piston and a cylinder assembly disposed adjacent to each of said first and second working surfaces, such that each one of said first and second working surfaces is coupled to a different piston and cylinder assembly, each piston and cylinder assembly applying one of a driving force and a resisting force to a different one of the first and second working surfaces.

52. (New) A bending die for use in sheet metal forming, comprising:

(a) a first working surface extending longitudinally relative to a longitudinal axis of the bending die;

(b) a second working surface extending longitudinally relative to the longitudinal axis of the bending die and disposed adjacent to said first working surface; and

(c) a frame configured to provide support for said first and second working surfaces, while enabling said first and second working surfaces to move relative to the frame, such that a substantially fixed separation between adjacent edges of the first and second working surfaces is maintained, regardless of a rotational angular displacement of either of the first and second working surfaces, said frame comprising a first section and a second section, a position of said first section relative to said second section being adjustable to enable a width of a gap separating the adjacent edges of said first and second working surfaces to be adjusted to a desired dimension.

LAW OFFICES OF RONALD M. ANDERSON
600 - 108th Avenue N.E., Suite 507
Bellevue, Washington 98004
Telephone: (425) 688-8816 Fax: (425) 646-6314